

REFLECTIONS IN PREHOSPITAL CARE

Life-saving or life-threatening? Prehospital thoracostomy for thoracic trauma

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A bus was involved in a roll-over road traffic accident. Most occupants were ejected from the vehicle. Primary triage revealed 9 dead, 1 P4 (unsalvageable), 5 P1 (immediate life threat) and 30 less severely injured patients. Two prehospital doctors performed a secondary triage, provided medical supervision and performed critical care interventions where necessary.

A young man initially triaged as P4 was upgraded to P1. Primary examination revealed an unmaintained airway with vomit in the pharynx, central trachea, distended neck veins, chest wall abrasions, deep respiratory gasps (6 breaths/min), absent breath sounds and a weak central pulse. The Glasgow Coma Scale (GCS) was 6/15 (E1, V1, M4) and pupils were equal, 3 mm and reactive to light. The left femur was fractured.

Monitoring confirmed a sinus tachycardia of 150 beats/min, but oxygen saturation (SpO₂) and non-invasive blood pressure (NIBP) were unrecordable. SpO₂ of 60% was obtained with bag-valve-mask ventilation.

A rapid-sequence induction using etomidate (16 mg intravenous) and suxamethonium (100 mg intravenous) was performed and the airway secured with a size 8.0 tracheal tube. Artificial ventilation revealed abnormally high airway pressure and no air entry. Bilateral thoracostomies were performed and digital examination revealed both lungs to be collapsed. A haemothorax drained from the left thoracostomy and a chest drain was inserted. Airway resistance improved remarkably and breath sounds returned. SpO₂ increased to 85% with ventilation and then to 100% after tracheal suction. Heart rate decreased to 120 beats/min and NIBP became measurable at 100/66. The patient was airlifted to hospital.

At the hospital, new chest drains were inserted through the thoracostomy sites. A CT scan of the brain was normal and the femur surgically repaired. Artificial ventilation was continued in the intensive care unit because of aspiration pneumonia and lung contusions. The patient made a full recovery.

DISCUSSION

Thoracic trauma is a major cause of mortality, with thoracic injuries being responsible for 25% of deaths from trauma and a contributing factor in a further 25%. Many of these deaths may be prevented with early effective management.

In over 85% of hospital patients with major thoracic injuries, treatment consists of airway control, supplemental oxygen and lung re-expansion with an appropriately placed chest drain. Chest x ray confirmation of the injury before chest drain insertion is recommended; however, life-threatening injuries should be corrected as identified during the primary survey.¹

Tension pneumothorax is a universally fatal condition if untreated. It is more common in patients who are ventilated than in those who are awake, and possibly most common in ventilated patients after chest trauma.

There is a notable difference in the presentation of tension pneumothorax between awake and ventilated patients. Awake patients compensate for the rising intrapleural pressure with

increasing respiratory effort, thus maintaining negative inspiratory pressures. They manifest progressive and severe hypoxia with respiratory deterioration and eventual respiratory arrest. These compensatory measures are eliminated in sedated and ventilated patients, allowing for rapid cardiorespiratory deterioration followed by cardiac arrest as a result of obstruction to central venous return.²

A potentially vulnerable period for the patient with trauma is the significant and inevitable delay between the time of injury and time of arrival at definitive care. The standard prehospital management of tension pneumothorax is needle decompression. This is a rapid, temporising measure that may be life saving but is regularly ineffective.^{2,3} It also does not allow for lung re-expansion, therefore hypoxia will persist and a definitive chest drain will still be required. Much controversy exists regarding chest-drain insertion during this prehospital phase. This is because of a presumed increased risk of complications in this environment, and prolonged scene times.

Serious complications associated with chest drains include iatrogenic organ injury or malposition on insertion, drainage system malfunction and infection.

Complications on insertion are minimal if appropriately trained and experienced practitioners use a lateral blunt dissection technique through the fourth or fifth intercostal space followed by a finger sweep before drain insertion. Trocars should not be used. It has been shown that under these conditions prehospital chest drain insertion is equally as safe and effective as those performed in a hospital.^{3,4}

Modification of this technique to a simple thoracostomy without drain insertion has valuable advantages in the prehospital setting. This technique may only be used in ventilated patients but reduces scene time, allows lung re-expansion, avoids drainage system malfunction and avoids pleural cavity contamination during drain insertion.³

Although a sterile field is improbable, many investigators have noted no increase in infectious complications in procedures performed in prehospital settings compared with those performed in the emergency department.^{4–6} In this case, there were no complications associated with the chest drains.

This case demonstrates the value of advanced chest decompression skills in the prehospital resuscitation of patients with critical trauma.

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Abbreviation: SpO₂, oxygen saturation

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